

It is claimed:

- 1           1.       A local oscillator (LO) circuit, comprising:  
2           a first LO source to generate a first periodic signal cycling at a first frequency;  
3           a second LO source to generate a second periodic signal cycling at a second  
4 frequency different than said first frequency;  
5           a limiter;  
6           a first switching element to selectively couple said first LO source to said limiter;  
7 and  
8           a second switching element to selectively couple said second LO source to said  
9 limiter.
- 1           2.       The LO circuit of claim 1, wherein said first and/or second switching  
2 element comprises a transistor.
- 1           3.       The LO circuit of claim 2, wherein said transistor comprises a field effect  
2 transistor.
- 1           4.       The LO circuit of claim 1, further comprising a transformer coupled  
2 between said limiter and said first and second switching elements, wherein said  
3 transformer comprises first and second differential transformer outputs.
- 1           5.       The LO circuit of claim 4, wherein said limiter comprises:  
2           a first differential transistor having a first conduction path and a first control input  
3 to control a resistance of said first conduction path, wherein said first control input is  
4 coupled to said first differential transformer output;  
5           a second differential transistor having a second conduction path and a second  
6 control input to control a resistance of said second conduction path, wherein said second  
7 control input is coupled to said second differential transformer output;  
8           a first resistive element coupled between said first conduction path and a power  
9 supply terminal;

10           a second resistive element coupled between said second conduction path and said  
11 power supply terminal; and  
12           a current source coupled between said first and second conduction paths and a  
13 ground terminal.

1           6.     The LO circuit of claim 5, wherein said first and/or second differential  
2 transistors comprises a bipolar transistor.

1           7.     The LO circuit of claim 5, wherein said first and/or second resistive  
2 elements comprises a resistor.

1           8.     A method comprising:  
2           generating a first LO signal cycling at a first frequency;  
3           generating a second LO signal cycling at a second frequency different than said  
4 first frequency;  
5           activating a first switching element to substantially produce said first LO signal at  
6 a node;  
7           de-activating a second switching element to substantially de-couple said second  
8 LO signal from said node, wherein a leakage LO signal is also produced at said node; and  
9           amplifying said first LO signal and said leakage LO signal at said node, wherein a  
10 gain associated with said first LO signal is greater than a gain associated with said  
11 leakage LO signal.

1           9.     The method of claim 8, wherein amplifying said first LO signal and said  
2 leakage LO signal is performed by a limiter.

1           10.    A receiver comprising:  
2           a mixer to down convert a received RF signal to an intermediate frequency (IF)  
3 signal; and  
4           a local oscillator (LO) circuit coupled to said mixer, wherein said LO circuit  
5 comprises:

6 a first LO source to generate a first periodic signal cycling at a first  
7 frequency;  
8 a second LO source to generate a second periodic signal cycling at a  
9 second frequency different than said first frequency;  
10 a limiter;  
11 a first switching element to selectively couple said first LO source to said  
12 limiter; and  
13 a second switching element to selectively couple said second LO source to  
14 said limiter.

1 11. The receiver of claim 10, further comprising a transformer coupled  
2 between said limiter and said first and second switching elements, wherein said  
3 transformer comprises first and second differential transformer outputs.

1 12. The receiver of claim 11, wherein said limiter comprises:  
2 a first differential transistor having a first conduction path and a first control input  
3 to control a resistance of said first conduction path, wherein said first control input is  
4 coupled to said first differential transformer output;  
5 a second differential transistor having a second conduction path and a second  
6 control input to control a resistance of said second conduction path, wherein said second  
7 control input is coupled to said second differential transformer output;  
8 a first resistive element coupled between said first conduction path and a power  
9 supply terminal;  
10 a second resistive element coupled between said second conduction path and said  
11 power supply terminal; and  
12 a current source coupled between said first and second conduction paths and a  
13 ground terminal.

1 13. The receiver of claim 10, further comprising a low noise amplifier (LNA)  
2 to amplify said received RF signal, wherein an output of said LNA is coupled to an input  
3 of said mixer.

1           14.     The receiver of claim 10, further comprising an image reject filter to reject  
2     an image signal present in said received RF signal, wherein said image reject filter is  
3     coupled to an input of said mixer.

1           15.     The receiver of claim 10, further comprising an IF filter to remove  
2     undesired signals from said IF signal.

1           16.     The receiver of claim 10, further comprising an IF amplifier to amplify  
2     said IF signal.

1           17.     A transmitter comprising:  
2             a mixer to up convert an intermediate frequency (IF) signal to a radio frequency  
3     (RF) signal; and  
4             a local oscillator (LO) circuit coupled to said mixer, wherein said LO circuit  
5     comprises:  
6                 a first LO source to generate a first periodic signal cycling at a first  
7             frequency;  
8                 a second LO source to generate a second periodic signal cycling at a  
9             second frequency different than said first frequency;  
10             a limiter;  
11             a first switching element to selectively couple said first LO source to said  
12     limiter; and  
13             a second switching element to selectively couple said second LO source to  
14     said limiter.

1           18.     The transmitter of claim 17, further comprising a transformer coupled  
2     between said limiter and said first and second switching elements, wherein said  
3     transformer comprises first and second differential transformer outputs.

1           19.     The transmitter of claim 18, wherein said limiter comprises:

2 a first differential transistor having a first conduction path and a first control input  
3 to control a resistance of said first conduction path, wherein said first control input is  
4 coupled to said first differential transformer output;

5 a second differential transistor having a second conduction path and a second  
6 control input to control a resistance of said second conduction path, wherein said second  
7 control input is coupled to said second differential transformer output;

8 a first resistive element coupled between said first conduction path and a power  
9 supply terminal;

10 a second resistive element coupled between said second conduction path and said  
11 power supply terminal; and

12 a current source coupled between said first and second conduction paths and a  
13 ground terminal.

1 20. The transmitter of claim 17, further comprising a power amplifier to  
2 amplify said RF signal, wherein an input of said power amplifier is coupled to an output  
3 of said mixer.

1 21. The transmitter of claim 17, further comprising an image reject filter to  
2 reject an image signal present in said IF signal, wherein said image reject filter is coupled  
3 to an input of said mixer.

1 22. The transmitter of claim 17, further comprising an RF filter to remove  
2 undesired signals from said RF signal.

1 23. The transmitter of claim 17, further comprising an IF amplifier to amplify  
2 said IF signal.

1 24. An apparatus, comprising  
2 a mixer including a local oscillator (LO) input; and  
3 a limiter having an output coupled to said LO input of said mixer.